

Maryland School  
Assessment  
**Science**  
2010 Public Release  
Grade 5

---

# Part 1

- 1 A parent and a child share several characteristics. Both individuals are tall, have curly hair, are good cooks, and have freckles.

Which of these characteristics is a learned behavior?

- ☐ A being tall
- ☐ B having curly hair
- ☐ C being a good cook
- ☐ D having freckles

- 2 Materials combine chemically or physically.

Which materials form a new substance when chemically combined?

- ☐ A salt and pepper
- ☐ B water and sugar
- ☐ C iron nails and pennies
- ☐ D baking soda and vinegar

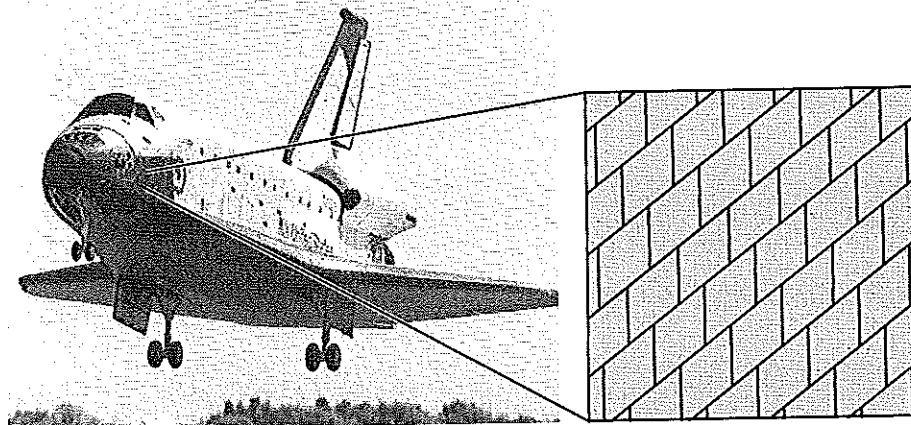
# Part 1

- 3 Heating and cooling water change the state of matter of water.

What happens when a block of ice is heated to 10° Celsius?

- ☐ A It melts to form liquid water.
- ☐ B It condenses to form liquid water.
- ☐ C It freezes to become heavier ice.
- ☐ D It evaporates to become a vapor (gas).

# Part 1



Space Shuttle

Heat Tiles

**4** Which measurement best represents the distance of the orbiting space shuttle from Earth?

- ☐ A 300 liters
- ☐ B 300 seconds
- ☐ C 300 kilograms
- ☐ D 300 kilometers

**5** What is the primary source of friction on the space shuttle during re-entry?

- ☐ A the gravity of Earth
- ☐ B the pull of the moon
- ☐ C particles of pollution in the air
- ☐ D air molecules in the atmosphere

# Part 1

## Directions

Use the passage and the following pictures to answer Numbers 4 through 6.

### Space Shuttle Re-entry

The space shuttle program uses spaceships to carry humans from Earth to space and back again.

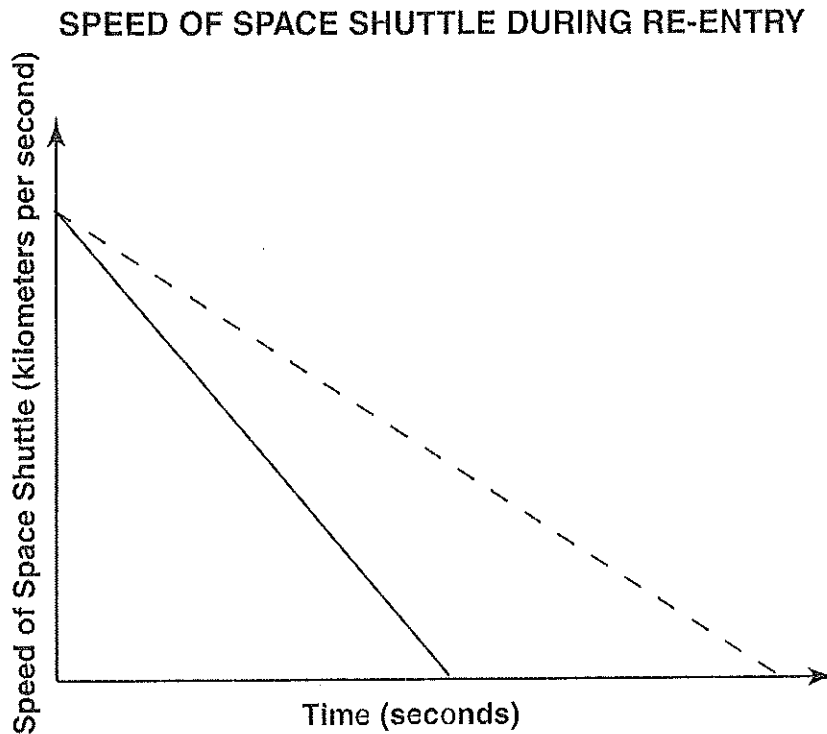
It takes a lot of fuel to produce the force needed to lift a space shuttle from Earth to space because the lift force must act against the force of gravity pulling down on the space shuttle. Much less fuel is needed to bring the space shuttle back to Earth. When the astronauts on a space shuttle complete a mission, they use the force of gravity acting on the space shuttle to pull it down from space to Earth's surface.

This landing process is not entirely without problems. Once the space shuttle moves from space into Earth's atmosphere, the space shuttle begins to hit air molecules. Although air is a gas, the space shuttle moves so quickly that it hits many air molecules with a great amount of force. Those hits result in friction with the air around the space shuttle. The friction slows the downward motion of the space shuttle and produces a large amount of heat.

Because of the heat produced, the space shuttle needs heat-resistant tiles so the inside of the space shuttle does not get too hot as it lands. The heat produced by the friction between the tiles and the atmosphere produces an orange glow as the shuttle moves toward Earth's surface.

# Part 1

- 6 The graph below shows two possible speeds of a space shuttle as it re-enters the atmosphere. The solid line represents the likely speed of the space shuttle as it passes through air molecules in the atmosphere. The dotted line represents the likely speed of the space shuttle if there were no air molecules in the atmosphere.



KEY	
---	= No air molecules
—	= Air molecules

# Part 1

**Explain how air molecules affect the space shuttle during re-entry. In your explanation, be sure to include**

- the relationship between air molecules and forces acting on the space shuttle

**Write your answer in the space provided.**

[illegible]

# Part 1

- 8 While walking along the trail, the hiker sees a fossil that looks like a shell.

Which statement best explains the presence of this fossil in the canyon?

- ☐ A Lava formed the fossil.
- ☐ B Wind carved a rock to look like a shell.
- ☐ C The area was covered by a glacier in the past.
- ☐ D The area was covered by liquid water in the past.

- 9 A large river flows along the bottom of the canyon. The vertical distance between the upper rim of the canyon and the river is 1,743 meters.

What process is most responsible for the depth of the canyon?

- ☐ A One large flood moved the rock layers.
- ☐ B Hot magma melted a path through the rock layers.
- ☐ C Many strong tornadoes eroded the rock layers over time.
- ☐ D Flowing water eroded the rock layers slowly over many years.





# Part 1

- 10** At 9:00 P.M., the hiker is in camp and observes that the constellation Orion appears to be directly overhead. At 3 A.M., the constellation does not appear directly overhead.

What best explains the change of location in the sky for the constellation Orion?

- ☐ A Earth rotated on its axis.
- ☐ B Earth revolved around the sun.
- ☐ C The constellation orbited Earth.
- ☐ D The constellation moved in the sky.

# Part 1

## Directions

Use the information below to answer Numbers 11 and 12.

The data table below shows information a student collected.

**FEATURES OF FOUR ANIMALS**

Animal 1	Animal 2	Animal 3	Animal 4
<ul style="list-style-type: none"><li>• Lives on land</li><li>• Has dry, scaly skin</li><li>• Has lungs</li><li>• Lays eggs</li><li>• Cold-blooded</li></ul>	<ul style="list-style-type: none"><li>• Lives on land</li><li>• Has feathers</li><li>• Has lungs</li><li>• Lays eggs</li><li>• Warm-blooded</li></ul>	<ul style="list-style-type: none"><li>• Lives on land or in water</li><li>• Has moist skin</li><li>• Has lungs</li><li>• Lays eggs</li><li>• Cold-blooded</li></ul>	<ul style="list-style-type: none"><li>• Lives in water</li><li>• Has scales</li><li>• Has gills</li><li>• Lays eggs</li><li>• Cold-blooded</li></ul>

# Part 1

- 11** Snakes, tortoises, and alligators are examples of reptiles. Most reptiles live on land and have scales. Reptiles were the first animals to develop the ability to lay hard-shelled eggs.

Based on this information and the data table, which animal is most likely a reptile?

- ☐ A Animal 1
- ☐ B Animal 2
- ☐ C Animal 3
- ☐ D Animal 4

- 12** Most amphibians, such as frogs, live on land and reproduce in water.

Based on the information in the data table, which of these animals is most likely an amphibian?

- ☐ A Animal 1
- ☐ B Animal 2
- ☐ C Animal 3
- ☐ D Animal 4



# Part 2



## Part 2

### Directions

Use the information below to answer Numbers 15 through 17.

Students examined plants and animals that live in and near the Chesapeake Bay. The students identified some features of these organisms, as seen in the table below.

Organism	Habitat	Animal or Plant	Role
Bald eagle	Land/water	Animal	Consumer
Bay grass	Water	Plant	Producer
Deer	Land	Animal	?
Cypress tree	Land/water	Plant	Producer
Mute swan	Water	Animal	?
Oyster	Water	Animal	?
Pine tree	Land	Plant	Producer
Sandbar shark	Water	Animal	Consumer
Striped bass	Water	Animal	Consumer

- 15 The bald eagle hunts and eats other organisms.

Which of these organisms does the bald eagle most likely hunt?

- ☐ A bay grass
- ☐ B deer
- ☐ C oyster
- ☐ D striped bass



## Part 2

- 16** Underwater plants are needed for the Chesapeake Bay habitat to be healthy. Eelgrass is one of the most common underwater plants in the bay area.

Which of these methods is the most likely way that thousands of eelgrass seeds are spread naturally throughout the bay area?

- ☐ A The constant motion of the waves transports the seeds.
- ☐ B Fish eat the seeds and spit them out at another location.
- ☐ C The seeds stick to bobcat fur and fall in the water as the bobcat swims.
- ☐ D Birds gather the seeds on their feet and drop them in the water while flying.

- 17** The students discover that mute swans eat mainly bay grass.

What role do mute swans have in the Chesapeake Bay area?

- ☐ A consumer
- ☐ B decomposer
- ☐ C producer
- ☐ D scavenger



## Part 2

- 18 Wind is a natural resource that benefits the southeastern shore of the Chesapeake Bay.

How could these winds best benefit humans?

- ☐ A The winds could blow oil spills into the bay.
- ☐ B The winds could be converted to fossil fuel.
- ☐ C The winds could blow air pollution toward land.
- ☐ D The winds could be converted to electrical energy.

# Part 3





## Part 3

- 24** A student notices a paw print while walking in a park.

The paw print could be considered a fossil if the print was in

- ☐ A rock
- ☐ B topsoil
- ☐ C thick mud
- ☐ D loose sand



# Part 3

## Directions

Use the information and table below to answer Numbers 25 through 27.

A group of students investigated natural resources and the products humans make from these natural resources. The students recorded their findings in the table below.

**NATURAL RESOURCES**

Natural Resources	Renewable or Nonrenewable	Products
Trees	Renewable	Paper, furniture
Plants (cotton, corn)	Renewable	Clothing, food
Fossil fuels (oil, coal)	Nonrenewable	Gasoline, electricity, plastics
Metals (iron, aluminum)	Nonrenewable	Steel, cans
Lakes, rivers	Renewable	Drinking water

# Part 3

**25** Which product is made mainly from a nonrenewable resource?

- ☐ A a paper bag
- ☐ B a wool sweater
- ☐ C a cardboard box
- ☐ D a plastic wrapper

**26** Humans do not use cows

- ☐ A for milk
- ☐ B for meat
- ☐ C to make paper
- ☐ D to make leather

**27** Which action positively affects the environment?

- ☐ A planting native seedlings when trees are cut
- ☐ B collecting seeds from native trees
- ☐ C harvesting trees to make paper
- ☐ D clearing trees to build roads



## Part 3

- 28** Some foods that humans eat, such as corn and peas, are actually seeds from plants.

What best describes the role of humans in a food web containing these plants?

- ☐ A a consumer
- ☐ B a decomposer
- ☐ C a producer
- ☐ D a scavenger

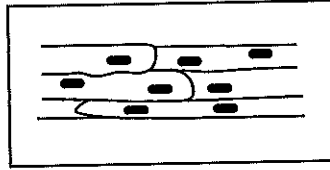
- 29** A student wants to show that the matter in a whole apple is equal to the matter in the pieces of the same apple.

Which process best describes how the student can demonstrate the relationship between the matter in the whole apple and the apple pieces?

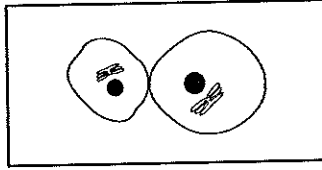
- ☐ A observing the apple pieces
- ☐ B cutting the apple into more pieces
- ☐ C observing the color of the whole apple, then observing the color of the apple pieces
- ☐ D determining the mass of the whole apple, then determining the mass of the apple pieces

# Part 3

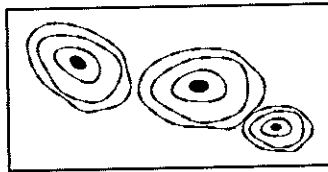
**30** Several different types of cells are shown below.



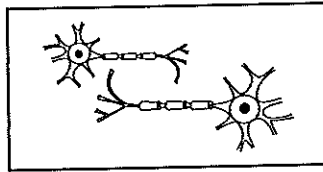
Muscle Cells



Skin Cells



Bone Cells



Nerve Cells

Which two types of cells are most similar in shape?

- ☐ A skin cells and bone cells
- ☐ B nerve cells and skin cells
- ☐ C bone cells and nerve cells
- ☐ D muscle cells and skin cells

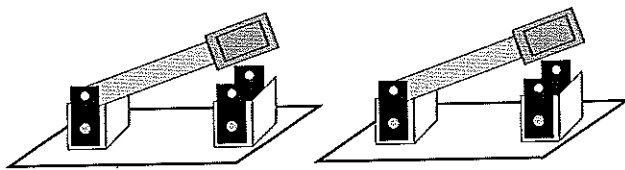


# Part 3

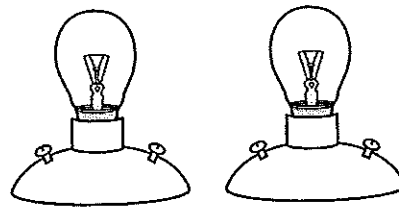
## Directions

Use the information and diagram below to answer Numbers 31 through 33.

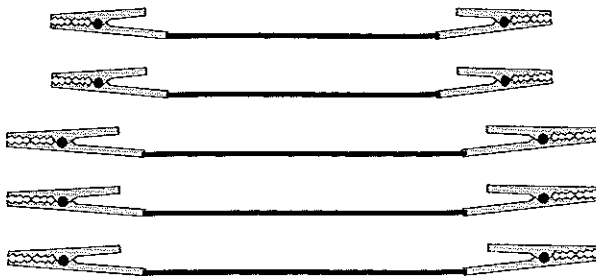
Two students built different electrical circuits using the materials below.



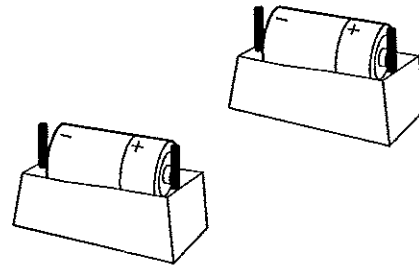
Switches



Light Bulbs in Bases



Copper Wires with Alligator Test Clips



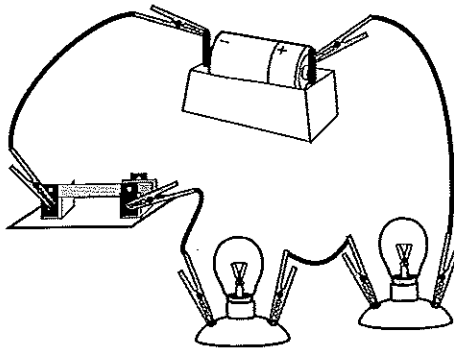
Batteries in Holders



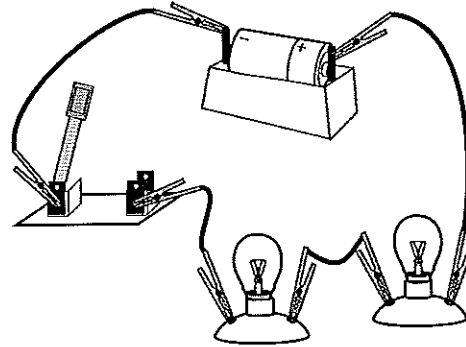
# Part 3

31 Which of the circuits shown below will make both light bulbs glow?

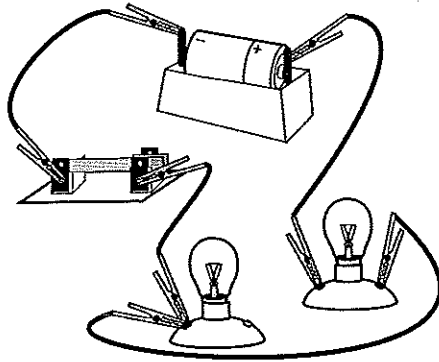
☐ A



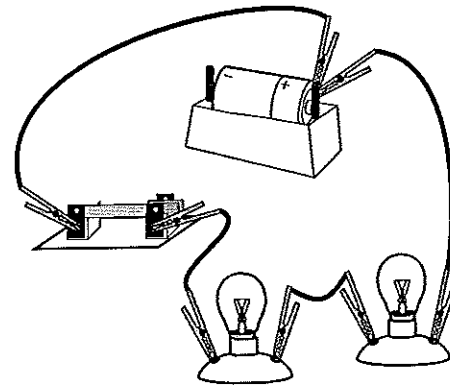
☐ B



☐ C



☐ D



## Part 3

- 32** The students replaced the switch in a closed circuit with four different objects.

Which of the following objects conducted electricity and made the light bulb glow?

- ☐ A a glass slide
- ☐ B a rubber band
- ☐ C a copper penny
- ☐ D a wooden toothpick

- 33** The students observed that removing the switch in a closed circuit and adding a plastic spoon or a piece of string did not make the light bulb glow.

The students concluded that the plastic spoon and the piece of string

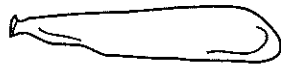
- ☐ A conducted heat
- ☐ B did not conduct heat
- ☐ C conducted electricity
- ☐ D did not conduct electricity



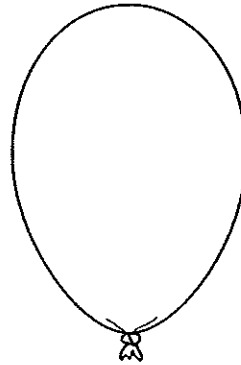
## Part 3

34

A student measures the mass and volume of a balloon before filling the balloon with air. The student then fills the balloon with air and measures the mass and volume again.



Deflated Balloon



Inflated Balloon

Which set of properties best explains how the mass and volume in the inflated balloon are different from the mass and volume in the deflated balloon?

- ☐ A less mass, less volume
- ☐ B less mass, more volume
- ☐ C more mass, less volume
- ☐ D more mass, more volume



## Part 3

35

Many states require vehicles to be examined and to meet safety and pollution standards.

What Impact might vehicle inspections have on the environment?

- ☐ A The environment will not be polluted.
- ☐ B The environment will become more polluted.
- ☐ C Fewer pollutants will be released by vehicles.
- ☐ D Fewer pollutants will be produced by older vehicles.

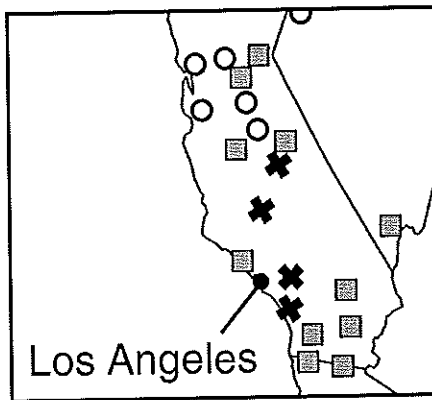


## Directions

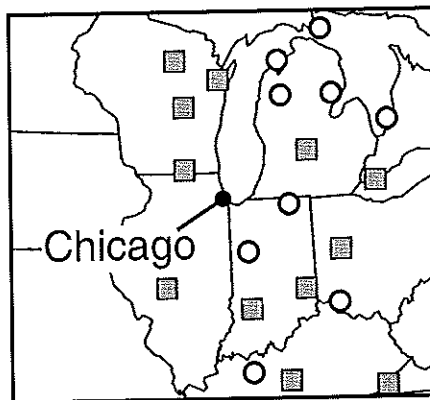
Use the information below to answer Numbers 36 through 38.

The maps below show information about the air quality for one day in June, as reported from different air quality stations.

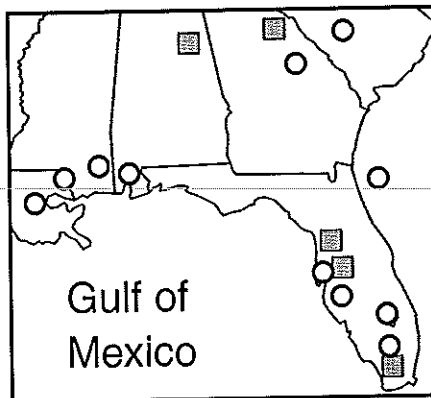
### AIR QUALITY IN THE UNITED STATES



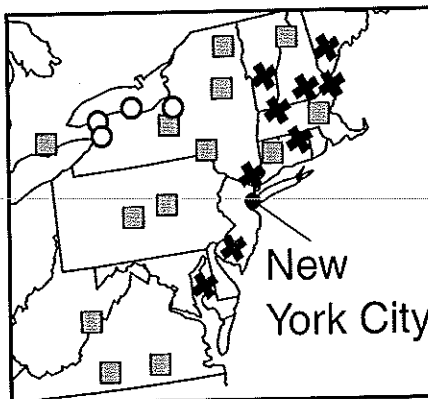
Los Angeles Area



Chicago Area



Southern Florida



Eastern Coast

KEY	
○	= Good
■	= OK
✖	= Unhealthy



## Part 4

**36** Which of the following regions of the United States had the worst air quality on this day?

- ☐ A Gulf Coast
- ☐ B Chicago Area
- ☐ C Eastern Coast
- ☐ D Los Angeles Area

**37** Which of these activities is the most likely source of poor air quality?

- ☐ A grazing cattle
- ☐ B planting crops
- ☐ C burning tires
- ☐ D recycling aluminum

**38** Which nonrenewable resource is used by most cars and trucks?

- ☐ A oil
- ☐ B coal
- ☐ C minerals
- ☐ D sunlight

39

The data table below compares three features of four plants. The four plants are in the same plant family.

Plant Name	Flower Color	Stem Shape	Height (centimeters)
Common sage	Purple	Square	60
Clary sage	White	Square	100
Russian sage	Purple	Square	120
Lampwick plant	White	Square	150

What feature must a plant have to be grouped into this plant family?

- ☐ A purple flowers
- ☐ B square stems
- ☐ C a height less than 90 centimeters
- ☐ D a height greater than 90 centimeters

**Directions**

Use the passage below to answer Numbers 41 through 43.

**A New Glue . . . from Inside Cow Bellies?**

If you take a drive through the country, you might see a herd of cows munching on grass and shrubs. Unlike us, they can eat and digest tough, fibrous plants. They can do this, in part, because of bacteria that live in their bellies.

Those bacteria, like some that live in your own stomach, are very helpful. They feed on chewed-up food once it makes its way down into the cow's gut. This helps grind the plant chunks into even smaller pieces so the cows can get the most nutrients from their food.

Paul Weimer studies these bacteria. He's a microbiologist with the Agricultural Research Service in Madison, Wisconsin.

One day Dr. Weimer was watching some bacteria under a microscope. They were turning plant chunks into food for themselves and the cow in which they lived. He was impressed with how tightly the bacteria stuck to the plant material, and that gave him an interesting idea: "If the bacteria are so good at sticking to plant materials, wouldn't they be good at sticking to other similar things, like wood? Could they be used to make a wood glue?"

Do you know why these little bacteria are so good at attaching themselves to things?

Dr. Weimer explains, "They have an outer slime layer that allows them to cling to a surface. In my laboratory, they stick so tightly to plant material, or cellulose, I can't get them off without destroying them."

Other bacteria are good clingers too. Some can stick to our teeth and cause cavities if we don't brush them off. Eeeww!

It might sound really weird to you, but finding bacteria that can form a glue is a great discovery. It could help replace some of the smelly and expensive chemicals that are used right now to make wood products. That could help the environment.

**Explain how cows, grasses, and bacteria interact within an environment. In your explanation, be sure to include**

- the role of each of the organisms in the environment
- how the organisms depend on each other

**Write your answer in the space provided.**

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper appears to be a standard notebook page.



## Part 4

44 The monument carved in Mount Rushmore is most likely weathered year-round by

- ☐ A a river
- ☐ B a glacier
- ☐ C shifting winds
- ☐ D ocean currents

45 Coral, clam, and starfish fossils are common in South Dakota.

These fossils are evidence that South Dakota was once

- ☐ A a forest area
- ☐ B covered by water
- ☐ C flooded by spring rains
- ☐ D at the edge of a tectonic plate

46 Over the next 20,000 years, Mount Rushmore will most likely

- ☐ A melt because of volcanic explosions
- ☐ B erode because of water and wind
- ☐ C crumble because of hurricanes
- ☐ D freeze because of glaciers

